

Comparative Study of Morbidity and Mortality Patterns among Meconium-stained Newborns receiving Oropharyngeal and Intratracheal Suctioning

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Summary

Archibong EI, Asindi AA, Mustafa FS. Comparative Study of Morbidity and Mortality Patterns among Meconium-stained Newborns receiving Oropharyngeal and Intratracheal Suctioning. *Nigerian Journal of Paediatrics* 1999; 26: 25. Records of 9,200 infants born with meconium staining of the amniotic fluid in Abha Maternity Hospital, Saudi Arabia, during the period January 1985 to December 1997, were reviewed in order to compare the morbidity and mortality patterns in those receiving oropharyngeal as against those receiving intratracheal suctioning. Of this number, 6,050 (65.8 percent) were intubated for intratracheal suctioning while the remaining 3,150 (34.2 percent) were suctioned down to the oropharynx only. Regardless of the method of suctioning, the incidence of meconium aspiration syndrome (MAS) was the same (7 percent) in both groups. The consistency of the meconium, physical condition of the infant at birth, and whether the pharynx and vocal cords were meconium stained or not, did not appear to influence the frequency of MAS. However, morbidity as determined by the need for prolonged administration of oxygen (48.0 percent vs 79.4 percent) or mechanical ventilation (13.0 percent vs 39.9 percent) was comparatively less among the infants intubated for suctioning in the delivery room. Similarly, the frequency of pneumothorax (7.8 percent vs 32.6 percent), persistent foetal circulation (5.0 percent vs 18.5 percent) and fatality rate (1.9 percent vs 10.3 percent) were less in those who were intubated. These findings support the need for routine intubation for intratracheal suctioning in every meconium stained infant regardless of his condition at birth.

Introduction

MECONIUM aspiration syndrome (MAS) is a major cause of neonatal morbidity and mortality.¹⁻⁴ Studies

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have indicated that about five percent of meconium stained infants would develop MAS of whom 30 percent would require mechanical ventilation while 5 – 10 percent would die.¹ It has been recommended that all meconium stained infants should have immediate endotracheal intubation and direct suctioning of the tracheobronchial tree in the delivery room, irrespective of whether the pharynx is meconium stained or not.⁵ Conversely, other workers^{1,6} are of the opinion that only those babies with low Apgar scores or those with meconium stained pharynx and vocal cords deserve direct intratracheal toileting. However, there are studies which show that between 40 and 50 percent of meconium stained neonates with optimum Apgar scores still went on to develop MAS.^{7,8} In view of these controversies, we embarked on a retrospective survey to compare the morbidity and mortality patterns of meconium stained infants who received oropharyngeal compared to those

who received tracheal suctioning at birth. The rationale for this study was to attempt to establish which of these two methods is more likely to be more beneficial and effective in salvaging meconium stained infants.

Patients and Methods

The infants in the present study were born in Abha Maternity Hospital, Saudi Arabia, and admitted to the neonatal unit of the hospital. As a Unit policy, every delivery involving meconium-stained liquor was attended by a resident paediatrician and all such infants were admitted into the nursery of the hospital for observation and/or treatment of possible MAS. The charts of all meconium-stained infants and those with a diagnosis of MAS during the period, January 1985 to December 1997 (13 years), were reviewed. From the records of these infants, the following relevant data were extracted: gestational age, methods of suctioning and resuscitation, Apgar scores, clinical and radiological changes in the respiratory system, the consistency of the meconium (thick or thin), duration of ventilatory requirement, complications of MAS and the eventual outcome in each case. Since 1997, and as a routine practice, the usual mode of suctioning for all infants delivered in the hospital, has consisted of drainage of the nose, mouth and the oropharynx by gentle suction with a bulb syringe as soon as the head is delivered, and before the infant starts to cry. Following complete delivery, the infant is placed on a resuscitaire under a radiant warmer and the suctioning procedure is continued with a suction catheter. Additionally, those infants with meconium stain undergo immediate endotracheal intubation for direct intratracheal toileting in the delivery room. This involves the application of suction to the endotracheal tube (ETT) using an adapter to facilitate continuous suctioning while the ETT is gradually withdrawn. If meconium has been extracted below the cord, intubation and suctioning is repeated until the tube is cleared. Before 1997, there was no established and mandatory policy on the method of suctioning meconium-stained infants born in the institution, hence the decision on what approach to adopt was entirely that of the resident who attended the delivery. The implication of the latter is that not all the infants with meconium staining received direct intratracheal toileting. Therefore, in analysing the data obtained in this review, two groups of infants

were identified: those intubated and those who were not intubated for airway suctioning.

The diagnosis of MAS was made in any meconium-stained infant who developed respiratory distress, had meconium staining of the airway and chest radiograph showed areas of decreased aeration alternating with areas of hyperlucency giving a picture of irregular densities, and whose symptoms could not be otherwise explained.⁵ All such infants were routinely treated with ampicillin and gentamicin, while mechanical ventilation was instituted when necessary. Those whose condition was complicated by persistent pulmonary hypertension were managed with alkalinisation and tolazoline, there being no facilities for delivering extracorporeal membrane oxygenation (ECMO).

For statistical analysis of the data, the chi-square or Fisher's exact test was applied, wherever necessary.

Results

During the period under review, a total of 38,522 live births were recorded in Abha Maternity Hospital. Of this number, 9,200 (23.9 percent) infants were meconium-stained; 6,050 (65.8 percent) of these 9,200 were intubated for intratracheal suctioning while the remaining 3,150 (34.2 percent) received only oropharyngeal suctioning in the delivery room. Meconium aspiration syndrome was diagnosed in 656 (7.1 percent) of the 9,200 newborns.

The characteristics of these two groups of babies are shown in Table I. The mean birthweight and gestational ages of the two groups were fairly comparable. Of the 6,050 infants who were intubated, 5,060 (83.6 percent) were born through thick meconium; the pharynx and vocal cords were stained with meconium in all the 6,050 infants and 3,150 (52.1 percent) required positive pressure ventilation in the delivery room (Table I). By contrast, of the 3,150 newborns who were not intubated, 2,375 (75.4 percent) were stained with thin meconium, only 83 (2.6 percent) had meconium in the pharynx and vocal cords and 757 (24.0 percent) required positive pressure ventilation. These differences between the two groups are significant ($P < 0.0001$). In spite of these differences however, the frequency of MAS in the two groups was similar, being 423 (7.0 percent) out of the 6,050 intubated newborns and 233 (7.4 percent) of the 3,150 who were not intubated.

Table I

Characteristics of 9,200 Meconium-stained Newborns classified by Method of Suctioning in the Delivery Room

Characteristics	Trachea Suctioned (n=6050)	Oropharynx Suctioned (n=3150)	P values
Mean gestational age (weeks)	41.3	41.8	>0.5
Mean birthweight (gm)	3865	3595	>0.5
Apgar scores (median)			
One minute	4	6	
Five minutes	8	8	>0.5
Meconium consistency			
Thick	5060 (83.6)	775 (24.6)	
Thin	990 (16.4)	2375 (75.4)	<0.0001
Meconium staining of oro- pharynx and vocal cords	6050 (100.0)	83 (2.6)	<0.0001
Actively resuscitated	3150 (52.0)	757 (24.0)	<0.0001
Development of MAS	423 (7.0)	233 (7.4)	>0.5

MAS = Meconium aspiration syndrome

Figures in parentheses represent percentages

The clinical courses of the 656 infants who subsequently developed MAS were evaluated (Table II). Two hundred and three (48.0 percent) of the 423 newborns who were intubated and 185 (79.4 percent) of the 233 who were not intubated in the delivery room, required oxygen therapy, either by face mask or head box for more than 24 hours ($P < 0.0001$). Furthermore, among the 656 infants, 55 (13.0 percent) of those intubated and 93 (39.9 percent) of those who were not intubated ultimately required mechanical ventilation ($P < 0.0001$). The frequencies of pneumothorax and persistent foetal circulation were significantly higher ($P < 0.0001$) in those not intubated (32.6 percent, and 18.5 percent, respectively) than in those who were intubated (7.8 percent and 5.0 percent, respectively). In addition, case fatality was significantly greater ($P < 0.0001$) among infants who were not intubated (10.7 percent) than among those who were intubated (1.9 percent).

Discussion

This review has shown that the frequency of MAS among meconium-stained infants born in our hospital was seven percent during the period, 1985 to 1997. This frequency is not too dissimilar to the

five percent reported in a comparatively smaller series covering the years 1985 to 1989.⁹ The periods surveyed in the present series and the one reported by Wiswell & Henley,⁹ fell within the period when Cunningham *et al*⁶ were advocating a practice which limited direct intratracheal toileting to only those meconium-stained infants whose associated asphyxia was severe enough to require positive pressure ventilation in the delivery room. This recommendation assumed that only the meconium-stained infants with depressed respiration at birth were in danger of developing MAS.

It is interesting to observe from the present study that the incidence of MAS was seven percent irrespective of the method of suction in the delivery room (intratracheal or oropharyngeal). This tends to create the impression that the depth of suctioning does not make any difference to the development of MAS in meconium-stained infants. However, a further analysis of the clinical course of the MAS among the two groups, clearly demonstrated comparatively greater rates of morbidity and mortality in the group that had oropharyngeal suctioning only. The frequencies of prolonged oxygen requirement and mechanical ventilation were higher among those infants who were not intubated for intratracheal toileting. Also

comparatively greater numbers of the latter were more ill from pneumothorax and persistent pulmonary hypertension, conditions which necessitated prolonged bed occupancy and a drain on hospital resources. The situation culminated in a significantly greater mortality rate among babies who were not intubated for suctioning.

Records of the infants showed that the two

meconium and had oropharyngeal suction. The implication of this is that the consistency of meconium alone cannot be used to predict the outcome of these infants.

Carson, *et al*¹⁰ advocated selective intubation in infants with meconium staining of the vocal cords. Our study shows that 97.4 percent of the infants whose suctioning was limited to the orophar-

Table II

Clinical Course and Case Fatality in 656 Newborns with MAS who were suctioned in the Delivery Room

Course/Fatality	Trachea Suctioned (n=423)	Oropharynx Suctioned (n=233)	P values
Oxygen requirement for >24hr	203 (48.0)	185 (79.4)	<0.0001
Required mechanical ventilation	55 (13.0)	93 (39.9)	<0.0001
Development of pneumothorax	33 (7.8)	76 (32.6)	<0.0001
Persistent foetal circulation	21 (5.0)	43 (18.5)	<0.0001
Died	8 (1.9)	24 (10.3)	<0.0001

MAS = Meconium aspiration syndrome

Figures in parenthesis represent percentages

groups (intubated and non-intubated) were asphyxiated at birth with median one minute Apgar scores of four and six respectively, but that they improved rapidly with a median Apgar score of eight at five minutes. This is similar to the findings of other workers who observed that a majority of infants who developed MAS have Apgar scores which are considered to be good.^{2,8} It therefore becomes difficult to use this parameter to select whom to intubate.

The meconium was recorded as being thick in 83.6 percent of those who were intubated and thin in 75.4 percent of those who received oropharyngeal suction only. In spite of this difference, the morbidity was greater among the latter. Although the mechanical obstruction caused by thick meconium and the inflammatory response might be important, thin meconium-stained fluid tends to travel more easily down the bronchial tree to the distal alveoli. Consequently, a larger surface area of the bronchial tree is likely to be exposed to toxic meconium constituents and thereby set up inflammatory response at the level of the alveoli, where gaseous exchange takes place. It is therefore not surprising that our morbidity was greater in the infants who were delivered through thin

ynx did not have meconium-staining of their vocal cords compared to 100 percent of those who were intubated for suctioning because their pharynx and vocal cords were meconium stained. Nevertheless, equal proportions of the groups developed MAS. Our experience, therefore, does not support the recommendation of Carson *et al*¹⁰ since both categories of infants are in potential danger of developing aspiration pneumonia with all its attendant complications.

It would appear that it is impossible to accurately predict by any parameter, which of the meconium-stained infants would develop MAS. It may therefore, be rather misleading if one were to adopt a selective approach regarding whom to intubate in the delivery room based on the Apgar score, consistency of the meconium and staining of the pharynx or vocal cord. Complications emanating from delivery room intubation, from our unpublished experience and from the documented experience of others^{5,8,11} are extremely low. Our institution has since 1997 adopted a policy of intubating and directly suctioning all infants who are born through a meconium-stained liquor irrespective of their clinical status at birth. We strongly recommend this policy to others.

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